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## THE PARIS ELECTRICAL EXHIBITION.

WE doubt whether there is a single instance on record of an Industrial Exhibition being ready for opening on the appointed day. The Paris Electrical Exhibition forms no exception to this invariable state of things, and the ceremony which is said to be arranged to take place on the 1st of August, if it does take place, which seems doubtful, will be a mere farce, as it is certain that the arrangements in the various sections will be very far from complete at the beginning of the month. It seems somewhat strange that the delay which has always hitherto taken place on such occasions has not acted as a cure, but it seems that, for some reason or other, such cannot be the case.

The Palais de l'Industrie, in which the exhibition is to be held, is certainly admirably adapted for the purpose, as the amount of space available for the various exhibits is ample. As far as can be seen at present, the display which will be eventually presented will be very imposing, and will go far to give one an idea of the vast strides which electrical science has made within the last few years, and of the important position in the arts which it occupies.

Although nominally electrical, the exhibits in many cases will not be directly identified with electricity; a very large number of makers, for instance, will show fine specimens of stationary engines which, although nominally employed for driving dynamo-electric machines, are not necessarily, or indeed as a rule, to be employed for that purpose. At the time we write there are many signs of heavy engineering work being done, but the machines which are to be driven have either not arrived, or are still securely packed in the numerous cases which strew the exhibition building in (apparently) hopeless confusion.

In the centre of the great nave a model lighthouse is in course of erection, from the lantern of which the brilliant rays of the electric light will be shed. This erection will be the most conspicuous object in the building, and rightly so, as it was to lighthouses that the electric light was first applied with the greatest success. Many of our readers will no doubt recollect the interest which was taken in the highly successful show of the Holmes light in the British Exhibition of 1862, the latter being a date at which dynamo machines were unheard of, though it is now a source of wonder that they were so.

Numerous stands of more or less picturesqueness are scattered about the great nave in various stages of advancement, and conspicuous amongst these will be that erected for the British Postal Telegraph Administration, and in which a highly interesting display of ancient and modern apparatus (much being in working order) will be made. The great nave, as a rule, is restricted to purely telegraphic and electrical instruments, the heavier machinery being placed beneath the galleries. The display of apparatus in connection with electrical railway signalling promises to be extensive; in this department there has been an undoubted advance within the last few years, though it has been a difficult subject to deal with; considering the requirements that are necessary to make it really successful, it is by no means a subject which amateurs can deal with with chance of success.

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NEW COMPANIES.—A list of companies registered between January 1st, 1881, and June 30th, 1881, has recently been published in the *Investor's Guardian*. From it we have abstracted the following, which shows the names of those companies which are more or less connected with electricity, together with the amount of capital authorised in each case:

| | CAPITAL. |
|---|---|
| Automatic Telegraph Company, Limited | £100,000 |
| Anglo-Continental Telephone Company, Limited | 50,000 |
| British Gower Bell Telephone Company, Limited | 600,000 |
| Consolidated Telephone Construction and Maintenance Company, Limited | 300,000 |
| Electric Gas Lighting Company, Limited | 20,000 |
| Electric Light and Power Company, Limited | 150,000 |
| Fitzgerald Electric Light Company, Limited | 100,000 |
| Lancashire and Cheshire Telephone Company, Limited | 250,000 |
| Oriental Telephone Company, Limited | 300,000 |
| Provincial Telephone Company, Limited | 75,000 |
| Siemens Brothers and Company, Limited | 400,000 |
| Swan's Electric Light Company, Limited | 100,000 |
| Telephone Manufacturing and Maintenance Company, Limited | 250,000 |
| Telegraph Improvement Company, Limited | 100,000 |
| Representing a total capital of | £2,795,000 |

WE hear that the power absorbed by the Maxim machine in driving 120 Maxim together with 10 Weston lamps at the recent display in Euston Road, was ——, well, something enormous. Was it 70 horse-power?

## HENLEY'S NEW DYNAMO-ELECTRIC MACHINES.

MR. W. T. HENLEY, the well known telegraph engineer, has recently patented the following forms of dynamo-electric machines, which have, we believe, proved on trial to be quite successful.

Fig. 1 is a longitudinal sectional view of one of the improved forms of dynamo machines; fig. 2 is a transverse section showing the arrangement of the electro-magnets and revolving wheel carrying pieces of iron; fig. 3 shows the revolving wheel with the pieces of soft iron attached. A, A, are cast iron standards fixed to base plate, B, and to which the electro-magnets, *a*, *a*, *a*, *a*, *a*, *a*, and *b*, *b*, *b*, *b*, *b*, *b*, are bolted; these are made of cast or wrought iron, or, better, pieces of soft iron tube, which may be of the oval section shown in fig. 2, having soft iron ends welded in next the standards for bolting to the same; these tubes are filled with soft iron wire lengthways of the tube forced in tight, and are so fixed that their poles do not stand opposite each other, but the poles of the electro-magnets on each standard stand midway between the poles of the magnets on the other standard. C is the wheel made of brass fixed on the shaft, D; $C^1$, $C^1$, $C^1$, $C^1$, $C^1$, $C^1$, are six pieces of soft iron; these are fixed to the wheel, C, and as they revolve with the wheel they bring the poles of the electro-magnets on one standard alternately in magnetic connection with the poles of the electro-magnets on the other standard. The currents produced are by a commutator made to flow all in one direction through the coils of the magnets on one standard, so that the poles of those magnets always remain of one character, every alternate pole being north, the other south, so that in one revolution of the wheel with the pieces of iron these pieces are brought into close proximity with the poles of the electro-magnets marked *a* and *b*. As the wheel, C, revolves the electro-magnets, *a*, *a*, having their poles remaining of the same character, the pieces of iron, $C^1$, $C^1$, alternately make magnetic connection between the poles of the electro-magnets, *a*, *a*, and *b*, *b*, causing the latter to have their polarity reversed 12 times in each revolution of the wheel, C. For instance, supposing the wheel, C, fig. 3, to be trans-

FIG. 1.

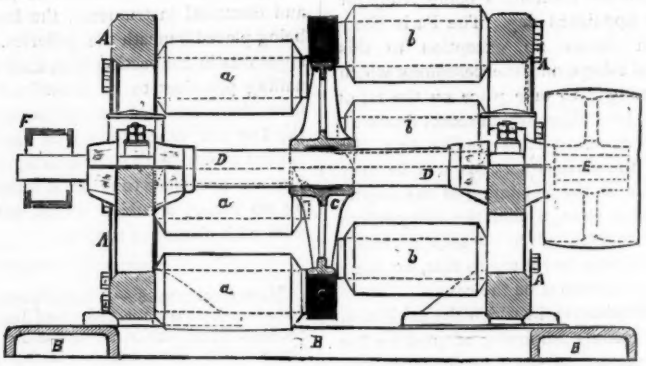



FIG. 2.

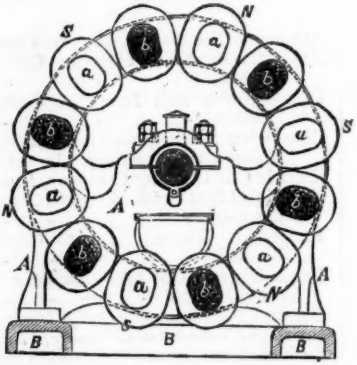
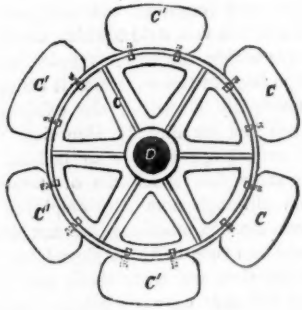



FIG. 3.



ferred to its place in fig. 2 in its present position, then the upper piece of iron, $C^1$, would be opposed to the north pole of the electro-magnet on the right hand, making that end of the piece of iron a south pole, the other end a north. This would render the pole of the electro-magnet, *b*, on the left a south pole, but when the wheel had advanced one-twelfth of a revolution to the right, the upper piece of iron has left the pole, *b*, and the following piece of iron has placed it in connection with the south pole of the other electro-magnet, *a*, thus reversing its polarity, making it a north; and, as before stated, this reversal takes place 12 times in each electro-magnet on one standard during one revolution of the wheel, C, but the pieces, $C^1$, $C^1$, $C^1$, have their polarity reversed only six times during the same time. The coils of the electro-magnets are connected with the commutator by means of the usual springs or brushes of metal pressing on the pieces of metal forming the commutator. In conveying the currents from the electro-magnets to the commutator, and from the same, the wires from the electro-magnets, *a*, *a*, are attached to terminals at one end of the machine, and the wires from the electro-magnets, *b*, *b*, to terminals at the other end of the machine, and the current for producing the light or other effect can be brought from either end of the machine. From one end alternate currents would be obtained, and from the other end currents all in one direction would be obtained, the terminals at the end from which the current is not taken being connected by stout copper wire.

Fig. 4 is a longitudinal section of another arrangement; fig. 5 is a transverse section; fig. 6 shows a wheel made of brass or other non-magnetic material carrying in this case pieces of iron, shown separately at fig. 7, which are made of sheet iron bent in the shape shown in this plan, fig. 7; these pieces of soft iron are wound with coils of wire so as to become electro-magnets. A, A, are the standards; B, the base plate; C, the wheel; *a*, *a*, *a*, *a*, *a*, *a*, and *b*, *b*, *b*, *b*, *b*, *b*, the electro-magnets; D, the shaft; F, the commutator; and E, the driving pulley. The iron pieces, *c*, *c*, *c*, *c*, on the wheel, C, are wound with coils of covered wire. The electro-magnets, *a*, *a*, *a*, and *b*, *b*, *b*, are placed with the poles of the electro-magnets on each standard opposite each other, as in figs. 5, 6 and 7. The com-

FIG. 4.

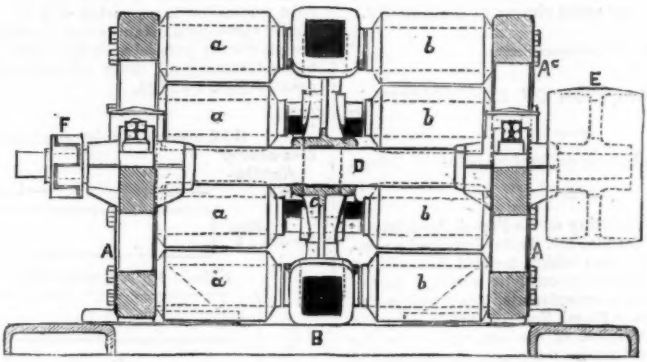



FIG. 5.

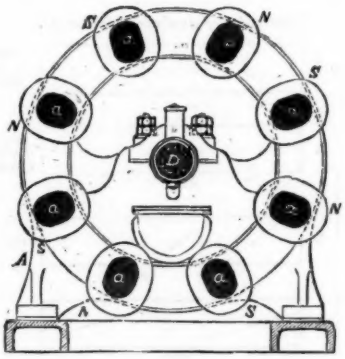
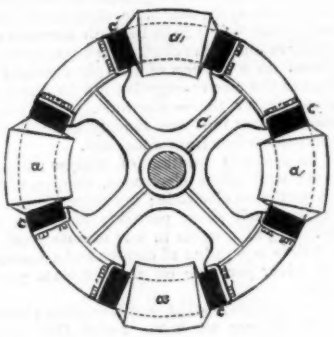



FIG. 6



mutator is so arranged that the fixed electro-magnets have similar poles opposite each other continually, as shown in fig. 5, so that the revolving electro-magnets have their polarity reversed eight

FIG. 7.

times in each revolution; if required, the currents may alternate in the fixed magnets, and then be brought by means of the commutator to the revolving magnets in such a way as to make their polarity remain of the same character continually.

## ON THE REFRACTION OF ELECTRICITY.

By ALFRED TRIBE, Lecturer on Chemistry in Dulwich College.

IN a paper read at a meeting of the French Association, Algiers, April 18th, 1881, Mr. Tribe described an ingenious chemical method which he had devised for investigating the field of electrolytic action. As the results of the author's experiments, described in the communication to the Royal Society, are based upon this method, a description of the latter, given in the paper referred to, will render more clear the account of the remarkable experiments on the "refraction of electricity."

When a rectangular plate of metal unconnected with the battery is placed lengthwise in an electrolyte undergoing electrolysis, the plate does work identical in kind with that being done by both electrodes. The electro-positive ion of the electrolyte separates and distributes itself on a portion of the plate nearer the + electrode, and the electro-negative ion on another part of the plate nearer the — electrode. The respective boundaries of these ions are sharply defined, and the intermedial space free from either ion.

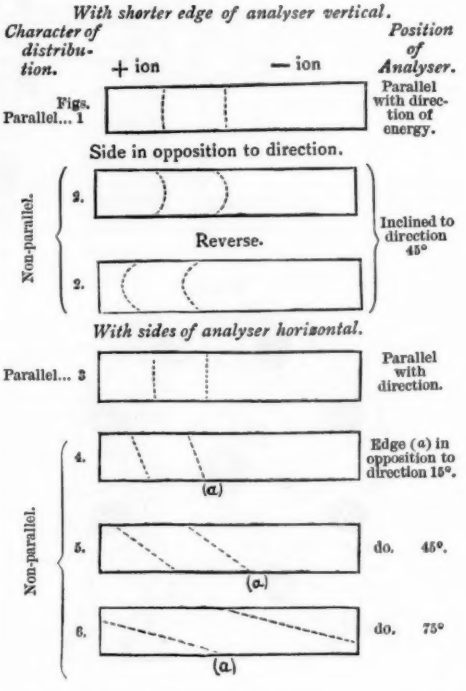
When an aqueous solution of copper sulphate is electrolysed with silver electrodes, copper, of course, separates on the — electrode; but more or less of the dark-gray or black silver peroxide forms on the + electrode. $\frac{1}{1000}$ of a weber in one minute produces, in fact, a sensible separation of copper and a sensible formation of silver peroxide on a silver plate 34 millim. × 7 millim.

It follows, therefore, that a silver plate placed in a solution of copper sulphate, under the conditions named in the first paragraph, should have copper deposited on that part which may be supposed to receive — electrification, and silver peroxide on that which receives the positive. Such is the case.

The registration of any set of electrifications in this way by the ions of electrolytes need take only a few minutes, the minimum time being determined by the dimensions of the analyser,* strength of electrolyte, and available current.

After the electric energy has done enough work on the analyser for the action to be visible, time is seen to exert no influence in determining the magnitudes of the distributions. Thus in 6 minutes and 60 minutes respectively, identical distributions were recorded by similar analysers, other circumstances being the same. But the magnitudes of the distributions registered by an analyser of given dimensions vary with every condition which may be supposed to alter the chemical or physical state of the electrolytic medium, as temperature, proportion of water, and electric quantity.

When at ordinary temperatures the analyser is placed with its length perpendicular to the electrodes in a homogeneous field,* although the superficial magnitudes of the ions vary, as stated, with any variation in the condition of the electrolytic medium, yet in every case one quality is seen to obtain, namely a similarity of the same ion on the two sides of the analyser, both as regards magnitude and configuration of its boundary line. This happens whether the plate has its shorter edge vertical or is supported with its sides horizontal. Under these circumstances the boundaries of the ions are practically parallel with the shorter edge. Distributions having all these characteristics are named *parallel* (figs. 1 and 3).




When the course of the energy makes an oblique angle with the edges of the analyser, but remains parallel to the sides of the latter, the electrifications recorded are also the same on the two sides of the plate; but the boundary-lines of the ions now cross the plate obliquely to its shorter edge (figs. 4, 5 and 6). The positive ion on the longer edge in opposition to the course of the energy is greatest in length, while the negative ion on the same edge of the plate is smallest

* The rectangular silver plate is named, for convenience, the *analysing plate*, or, in brief, the *analyser*.

* That is, where the electrodes are of the same depth and breadth as the cross section of the electrolyte.

in length. The obliquity and the intermedial space between the ions increase as the longer edge of the analyser approaches a line at right angles to the direction of the influence. But at whatever angle the plate is fixed, the boundary-lines of the ions are parallel with the electrodes, and therefore at right angles to the direction in which the energy is transmitted.

When the electric power makes an oblique angle with the *sides* of the analyser, the electrifications recorded present a totally different character. The magnitudes of the same ion and the configuration of its boundary-line are now very different on the two sides of the plate. On the side in opposition to the direct course of the energy, the configuration of the positive ion is markedly convex and greater in magnitude than it is on the reverse side of the plate, where, moreover, the configuration of this same ion is markedly concave (figs. 2, 2). Further, the configuration of the boundary-line of the negative ion on the first-named side of the analyser is concave and smaller in magnitude than on its reverse side, where again the boundary-line of the ion is convex. The intermedial space between the ions increases as the analyser approaches a position at right angles to the right line between the electrodes, and the characteristic boundary configurations become more and more marked. At right angles the positive ion is smaller in quantity, and arranged longitudinally along the centre of the side of the analyser facing the + electrode, while the negative ion on the reversed side is similarly disposed, but generally not so well defined.

The classes of distribution described in these two last paragraphs are named *non-parallel*. The dotted lines in the annexed diagram exhibit the boundary-lines and general characteristics of the parallel and non-parallel distributions.

It is obvious that the results described furnish the data for determining with ease and precision, first, physical differences in parts of an electrolytic field; and, secondly, the direction in which the energy is being transmitted relatively to either side or edge of the analysing-plate, and therefore of its direction in the electrolytic medium. *Many questions have occurred to me in the investigation of which the foregoing method might be expected to afford material assistance. But the one of immediate attraction was whether electricity is endowed, like light, heat, and sound, with the quality of refraction. From the general resemblance of the fundamental laws of the forms of energy, I instituted experiments in the expectation of finding an answer in the affirmative to this question, the better conducting electrolytic medium being taken as the electric analogue of the more rare medium in light.

### *Refraction.*

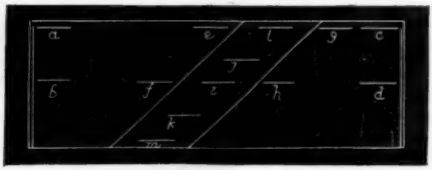
My first trials were made with double convex-shaped bladders. These gave what I took to be a slight evidence of refraction, though the result was far from satisfactory. Triangular-shaped cells were next employed, made by placing diaphragms of parchment-paper obliquely across the electrolytic cell near its ends. In this way unmistakable proof was obtained of the bending of the energy in passing the line of demarcation of the two media. When the influence passed from one medium to the other perpendicularly, *i.e.*, when the diaphragms were parallel to the plane of the electrodes, no refraction whatever took place.

On further consideration the arrangement which appeared less open to objection, and, at the same time, the most simple and theoretically the best, was a *refracting cell*, having parallel sides of some material permeable to the electric influence. In the first instance parchment-paper was the material employed. Two sheets of this substance were fixed in a vertical position across an electrolytic cell, 380 millims. long, 128 millims. broad, and 128 millims. deep, at an angle of 45°. They were parallel to one another, 76 millims. apart, but equidistant from the respective ends of the cell.

An unit current was employed, and copper electrodes of the breadth and depth of the outer or transmitting cell. A 1 per cent. solution of copper sulphate was placed in the inner or refracting cell, and a concentrated solution of the same salt in the transmitting cell. On placing successive analysers* lengthwise in several parts of the *central line* joining the electrodes, parallel distributions were recorded by all the plates in the transmitting cell, but the one in the refracting cell recorded a non-parallel distribution of a most pronounced character, and it was evident from the degree of curvature of the ions that the course of the energy on passing into the medium of less conductivity had bent out of its original course some 20°.

The difficulty of keeping the parchment diaphragms as rigid as was necessary for a more extended study of this phenomenon of refraction led to their substitution by others of unglazed earthenware. These consisted of the sides of a large rectangular porous cell ground to as uniform a thickness as possible. With this alteration, but with all the other above-mentioned conditions the following experiments were made.

Analysers were successively placed in the positions (all perpendicular to the electrodes) shown in the annexed diagram, exhibiting a horizontal section drawn to about one-fifth the scale.




The analysers, *a*, *b*, *c*, *d*, 2 millims. from electrodes, recorded parallel distributions.

The analysers, *e*, *f*, *g*, *h*, 2 millims. from diaphragm, recorded not absolutely but very nearly parallel distributions. This slight non-parallelism was not noticed in the analogous experiment with the parchment diaphragms, and I am disposed to attribute it to a greater diffusion in this case occasioning a less sharp line of demarcation between the media.

The analyser, *i*, midway between the diaphragms, recorded a non-parallel distribution of a most pronounced character. The degree of curvature showed that the energy had been refracted through some 30°, while the position of the ions proved that the bending was towards a perpendicular to the refracting surface. Furthermore, the symmetry of the curve showed that the plane of refraction was the same as that of the incident energy.

The analysers, *j*, *k*, indicated a result almost identical with *i*.

The analysers, *l*, *m*, showed a much smaller deviation from the original course of the energy.

(*To be continued.*)

* Communicated to the Royal Society, for A. Tribe, by Dr. Gladstone, F.R.S., June, 1881.

* Unless the contrary is stated, it is to be understood that analysers 40×7 millims. were used, and placed in the electrolyte with their shorter edges upright.

## FERGUSON AND KEMPE'S AUTOMATIC REGISTERING STAMP.

THE registration of the number of letters or circulars which are sent out from an office or house of business is often required; hitherto no means other than that of actually counting has been devised for the purpose. Messrs. H. Ferguson and H. R. Kempe have recently invented and patented a simple apparatus for automatically effecting the registration either electrically or mechanically.

When letters pass through an office they are impressed with stamps for obliterating, dating, and other purposes by means either of a hand or a lever stamp. Messrs. Ferguson and Kempe take advantage of this fact, and mount either the pad for inking the stamp or the pad on which the letter is placed to receive the stamp, on spring supports, and provide electrical contacts so arranged that when the pad receives the pressure of the stamp, a current of electricity is transmitted to an electrical counter, which is thereby moved one division. When the stamp is worked by a lever the contacts are arranged to be operated by the movement of the lever, the pads in that case not requiring the elastic supports above referred to. In cases where it is inconvenient to employ electricity for conveying the counting movement, the counter is constructed in combination with the hand stamp itself, and is worked mechanically in the following manner:—The stamp is fitted so that it can slide a little longitudinally in its handle, pressing it forward by a spring. Within the upper end of the handle is placed a small mechanical counter, the pawl which works its ratchet being connected to the sliding stamp, so that every time the stamp makes an impression the counter ratchet is moved one tooth. As for each act of stamping it is usual to subject the stamp to two pressures, one on the inking pad and one on the letter, the ratchet wheel of the counter is made with double the usual number of teeth, so that the two successive impulses move the counter only over one division.

Fig. 1 represents an arrangement of inking pad working in electrical connection with a counter. The pad is mounted on a hinged board which is pressed upwards by a spring against a stop. When the pad is pressed down by the act of inking a stamp, the upper spring is brought in contact with a lower spring. These two springs (seen in the small figure), which are fixed on a base of wood, are connected by conducting wires through a battery with an electrical counter. Every time the pad is depressed by the act of inking a stamp, a current of electricity is transmitted, which actuates the counter. When the stamping is effected by a lever, the electrical contacts are connected to the lever.

Fig. 2 is a vertical section of a self-registering hand stamp. The stamp is fixed on a stem which is fitted to slide in the handle, B, and is pressed down by a spring, its down stroke being limited by stop pins working in a slot of the handle. On the handle is screwed a hollow cap, D, containing within it the counter, C, which can be inspected by unscrewing the cap. The first wheel of the counter is worked by a pawl lever from the sliding stem, *a*, of the stamp, and this wheel has 20 teeth, the unit barrel on which it is fixed having, however, only 10 divisions. The barrels for the higher denominations are worked by gearing from the first in the usual way. Thus every time the stamp is subjected to pressure, the first wheel is turned one tooth, and the unit barrel is therefore turned half a division. For each stamping operation the stamp is twice subjected to pressure, once on the pad for inking it, and once for delivering the ink on the letter or object to be marked or obliterated. The counter therefore records the number of double strokes of the stamp, and therefore the number of single applications for marking or obliteration. The cap, D, is smooth and rounded externally so as to receive the pressure of the hand for inking and stamping, and it is made of the laterally bulged

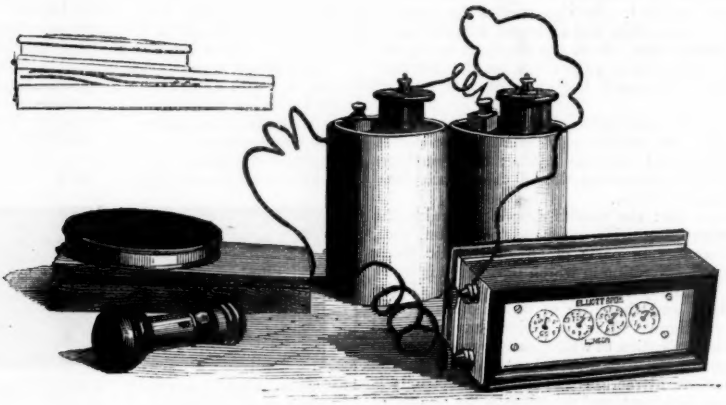


FIG. 1.

form shown, so that it presents considerable breadth to receive the pressure, and that it can be held firmly in the hand.

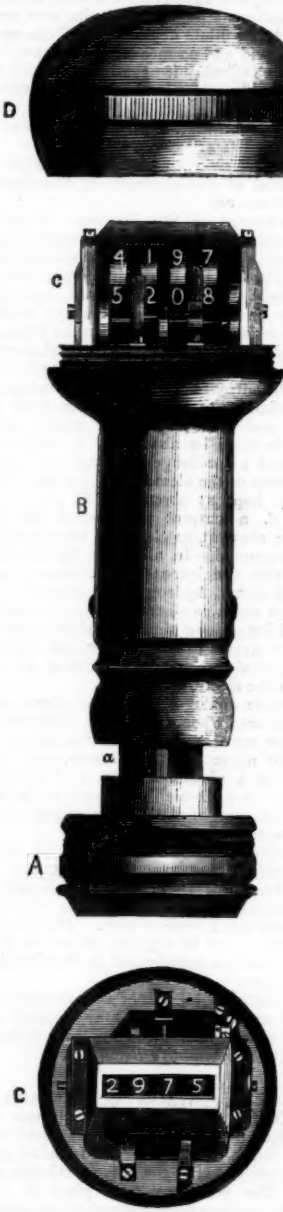



FIG. 2.

We may remark that the apparatus shown by the figures is manufactured by Messrs. Elliott Bros., of Charing Cross.

# Notes.

INVESTIGATIONS ON THE POTENTIAL DIFFERENCE OF TWO METALS IN CONTACT WITH EACH OTHER.—By H. Pellat.—In all methods, including that of the author, the apparent potential difference of the metals is measured, *i.e.*, the difference of the electric strata which cover them when in contact. It varies with the physical and chemical state of the surface. Thus the potential difference C u | A u = 0·137 against that of a Latimer Clark element when the copper has been cleaned with tripoli and washed with absolute alcohol. If the copper is exposed to sulphuretted hydrogen after washing in alcohol, it is = 0·201. The colour shows that the change has attained its maximum long before the superficial stratum has reached the thickness of a wave-length. A zinc plate rubbed with fine emery paper, and washed with alcohol, gives with gold Z n | A u = 0·698. After 14 days it has fallen to 0·523, though the zinc is still bright. After again polishing with emery, and washing with alcohol, 0·606; and if these operations are again repeated 0·738, which figure sinks in time to 0·690. If the plate is again treated with emery and alcohol, the figure becomes not 0·607 as before, but 0·693, or greater than before, after similar treatment. The author therefore concludes that this change is not due to a chemical modification, but to a mechanical hardening of the surface. With other metals the author has observed an increase of positivity effected by hardening, which is very transient if superficial, and more permanent if it penetrates deeper. Zinc shows this most strongly, copper less, and lead less still.

In indifferent gases the apparent potential increases with an increasing pressure, and on its removal returns to its original value. The variations do not exceed at most $\frac{1}{30}$th of the total value, and are greater in oxygen than in common air, but smaller in carbonic acid and in hydrogen. At a pressure of 20 to 30 mm. of mercury the influence of the nature of the ambient gas is scarcely perceptible. At the pressure of the atmosphere oxygen gives smaller values than air, nitrogen, or carbonic acid. Hydrogen has the same effect as air at from 20 to 30 mm. The influence of a change of pressure, or of the substitution of one gas for another, does not take place immediately, but gradually, so that the difference of potential is due, not directly to these changes, but to an alteration of the surface.

According to Thomson, two metals plunged into one liquid are at the same potential level. Then the electro-motive force of an element of two metals, M and $M^1$, and a liquid, F, must be equal to the potential difference of the two metals. The author has measured the latter directly, and the former by always employing metals in the same surface conditions as in the first measurements. For this purpose he introduced a drop of the liquid between the two plates, and measured the electro-motive force. According to the author the apparent potential difference of the metals, gold, silver, lead, zinc, brass, copper, the same as that of an element formed of these metals (unchanged), and a drop of alcohol. With very hard zinc the apparent potential difference and electro-motive force Z h | A u = 0·70; with softer zinc 0·60.

With water and dilute acids the surface of the metals is acted upon so rapidly that no comparison is possible.

If G is the gas surrounding the metals, the potential difference between two metals covered with the same, M and $M^1$ = G | M + M | $M^1$ | $M^1$ | G; the electro-motive force of the metals with one liquid F: F | M + M | $M^1$ + $M^1$ | F.

According to the experiments, if M and $M^1$ are of like value, both these expressions, are identical, changing with M and $M^1$. The author suggests that the constant value of these two expressions represents the true potential difference (common to both) of the metals M and $M^1$.—*Wiedemann's Beiblätter.*

ON THE INFLUENCE OF PRESSURE UPON THE ELECTRIC CONDUCTION-RESISTANCE OF METAL WIRES.—By O. Chwolson.—Wires of copper, brass, and lead were subjected to pressures up to 60 atmospheres in a piegometer, the changes of resistance being determined by means of Jacobi's mercurial rheostat (see *Carl's Repertorium*, 14, p. 1). The introduction of the rheostat was effected in a peculiar manner, for which the reader is referred to the original memoir. The pressures were applied at 4° C. and at the temperature of the room. At 4° C. the temperature of water remains unchanged on pressure.

Copper 0·4 mm. in thickness. At 4° C. and at a pressure of 1 atmosphere there was a relative decrease of about 0 000 001 3. At 17° C. an increase of resistance, *i.e.*, a predominance of the thermic action over the mechanical in consequence of the warming of the water.

Brass 0·463 mm. in thickness (63·66 copper, the rest almost entirely zinc). At 4° C. and a pressure of 1 atmosphere, a relative decrease of resistance of about 0 000 000 11. At 17·4° C. an increase of resistance. Here also there is a predominance of the thermic action.

Lead, 1·85 mm. in thickness. At about 7° C. a relative degree of resistance of about 0 000 012, or ten times more than in case of copper and brass. At 17° C. there is still a decrease, though smaller. Here the mechanical action predominates over the thermic.

For the brass wire the following determinations were made:—

The coefficient of elasticity, $E=526{\cdot}70\ r^{-3}$ kilo, $r$ expressing the radius of the wire in millimetres.

The coefficient of tension, $C=9{\cdot}755\ r^{-4}$ kilo.

The ratio of the transverse contraction to the expansion in length $w=27\ r^4\ -^1$, the action of stretching upon the resistance of conduction. The relation $\sigma$ of the relative change of resistance to the relative change of length, $\sigma=2{\cdot}305$.

The radius: $0{\cdot}2326 > r > 0{\cdot}2294$. From the changes of resistance found on stretching and pressing were deducted the portions due to the changes of form.

Supposing that the changes in density and length take an equal share in the change of the specific resistance, this latter may be regarded as proportiona to the change of the specific volume.—*Wiedemann's Beiblätter.*

ON THE ELECTRO-MOTIVE FORCE OF NON-CONSTANT ELEMENTS.—By A. Naccari and G. Guglielmo.—According to Exner in non-constant elements the electromotive force is independent of the nature of the electronegative polar plate, and is always = 0·73 D. These assumptions have been already refuted by Beetz. If the electro-motive force is greater or smaller it is said to be derived from the oxygen dissolved in the water, and from the diffusion of zinc vitriol to the negative plate. The liberation of hydrogen is supposed to be without influence upon the electro-motive force, just as the intensity of the current in a closed circuit.

The authors have experimented with a Mascart's electrometer and with a tilt resembling that designed by Exner. by which the current can be interrupted at a given moment and the poles of the element can be connected with the electrometer quadrant. The authors examined:

1. The influence of the positive plate at which the hydrogen appears. In all the elements the electrodes were contained in two vessels, connected by a syphon 36 centimetres long and 14 internal diameter, closed at each end with parchment paper. The zinc was completely amalgamated; the dilute acid contained one measure of concentrated acid and 20 measures of water. The resistance was changed. If negative plates of different materials were employed the electro-motive force amounted to:

| | *Platinum.* | *Platinised.* | *Carbon.* | *Copper.* |
|---|---|---|---|---|
| Open element | 1·41 | 1·56 | 1·38 | 0·96. |
| Strongest current | 0·60 | 0·71 | 0·44-0·30 | 0·53. |

The material of the electrode is, therefore, of the greatest importance.

2. The influence of the intensity of the current appears on the introduction of resistances, increasing or decreasing in such a manner that the electro-motive force decreases with the increasing power of the stream and inversely. With platinum this change takes place very rapidly on a change of intensity; with carbon very slowly; with platinised platinum the electro-motive force sinks little below the calculated value 0·75; even when the current of two Bunsen elements is introduced along with the current of the element experimented with.

3. The influence of the oxygen dissolved in water. There was used: *a.* a perfectly closed element in which no air could be absorbed; *b.* acid, which had been subjected to prolonged boiling, was poured, hot, into the glasses of the element; *c.* the acid, during the current, was kept at about 100° C. at the negative electrode; *d.* a current was passed for 21 hours through the element, so that any oxygen in solution might be consumed. In all cases, the electro-motive force rose with the increasing resistance above 0·73. If a current of air, hydrogen, or carbonic acid was passed by the negative electrode after the element had been closed for a long time, the electro-motive force increased in every case. The gases act all alike, removing probably the small bubbles of hydrogen adhering to the electrode.

Results quite analogous to those mentioned under 1 and 2 appeared when, instead of plate-shaped electrodes, wires were, with carbon electrodes, carefully purified with nitric acid and water, and heated to 100° C. with a platinum plate used instead of the copper plate in a Daniell's element, at least for the first. With a point of platinised platinum, the electromotive force sinks to 0·64.

4. Influence of sulphate of zinc. A zinc-carbon element carefully put together had when open the electro-motive force 1·36, but when closed 0·32. A careful chemical examination of the solution at the carbon showed not a trace of zinc. The sinking of the electro-motive force to 0·32, far below the theoretical value, can therefore not depend on the diffusion of the sulphate of zinc.

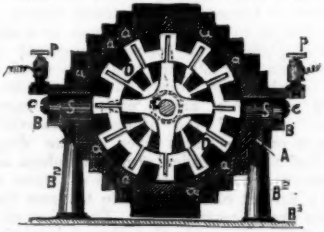
Hence, contrary to Exner's representations, the changes of current intensity may depend upon the known secondary phenomena in the element during electrolysis.—*Wiedemann's Beiblätter.*

THE PRINCE OF WALES AND TECHNICAL EDUCATION.—On Monday, July 18th, the Prince of Wales, who was accompanied by the Princess, laid, in Exhibition Road, South Kensington, the foundation stone of the central institution of the City and Guilds of London Institute. The ceremony took place in a spacious marquee, where there was an elevated dais covered with crimson cloth, in the centre of which there was suspended a polished Cumberland shap granite pillar, which had to be lowered on to a granite pedestal beneath. It appears from the plans of the architect,

Mr. Alfred Waterhouse, that the building will have a front of 300 feet, and five storeys, all but the top one averaging 15 ft. 9 in. from floor to floor; that the entrance will be approached by about sixteen steps from Exhibition Road, through a large and handsome hall, 37 ft. by 33 ft. 6 in., the groined ceiling of which will be supported by four pillars, one of which was the granite shaft set on the above day by the Prince of Wales; that there will be two lecture theatres, with preparation rooms behind them, each capable of holding 208 students; that on the first floor there will be a library 37 ft. by 33 ft.; and that, among other provisions for technical or scientific education, there will be chemical laboratories 76 ft. by 50 ft. in extent. The total cost is estimated by Mr. Waterhouse at about £66,000.

PROFESSOR IRA REMSEN, of Johns Hopkins University, has undertaken some novel experiments to ascertain whether the chemical behaviour of a metal is in any way influenced by magnetic action, and has arrived at results which are of considerable interest. His best effects were obtained by placing a shallow vessel of thin iron, containing a solution of copper sulphate, over the poles of a magnet. Out of the magnetic field the solution would deposit upon the iron vessel a uniform coating of copper. When brought within the field of a permanent magnet capable of supporting twenty-five kilogrammes (fifty-five pounds) the copper was deposited in a fairly uniform way on the entire plate, except at the lines marking the outlines of the poles. These lines were sharply marked as depressions in the deposit. When, instead of a permanent magnet, an electro-magnet was employed, the iron vessel and copper solution being the same as before, a more striking action was observed. There was no deposit of copper for a narrow space marking the outline of the poles. Within the outline (over the poles) the deposit was fairly uniform. Outside the blank outline marking the pole the copper was deposited in irregular ridges running at right angles to the lines of force, and apparently coincident with the lines marking the equipotential surfaces. By increasing the power of the electro-magnet the action is intensified and the area affected is broadened, the largest circles obtained in Prof. Remsen's experiment being nearly four inches in diameter. The cause of the phenomenon has not yet been determined, though the effects are obviously to be ascribed to the influence of the magnetism on the iron plate, or on the liquid, or on both together.—*Scientific American.*

A PATENT (No. 243,264, dated Oct. 23, 1880) for a dynamo-electric machine has been taken out in the United States by Mr. C. A. Hussey, of New York. In this machine, which is shown by the figure, the armature is completely inclosed in a hollow field-magnet, whose exciting wire is wholly external to the field-magnet. There is an electro-magnet composed of a core of internally circular form with wire wound over its exterior, without passing through its interior, from end to end, and inclosing it, save at certain places designed to form poles or consequent points.




MR. JOHN TROWBRIDGE has just completed the following experiment in the physical laboratory of Harvard University. He submitted a bar of iron to a great cold of 60° C. below zero, obtained by evaporating $CO_2$. He proved that the decrease of magnetism, suspected by Wiedemann, if the bar be at a lower temperature than that allowing magnetic impregnation, is indeed a demonstrated physical fact. The bar, which had been magnetised at 20° C. below zero, had lost almost two-thirds of its magnetism after 47 minutes of exposure to this cold. He also observed that, by keeping a bar of steel for a certain time at a temperature of 20° C., 50 per cent. of its primitive magnetism was restored.—*Science.*

A SERIES of technological handbooks, edited by Mr. H. Truman Wood, B.A., are about to be published by the Society of Arts. Amongst them will be "Telegraphs and Telephones," by W. H. Preece, F.R.S., Memb. Inst. C.E., Electrician to the General Post Office.

AMERICAN CABLE COMPANY.—The shore end of the second cable of this company was successfully landed at Whitesand Bay, Land's End, on the 21st ult., by the telegraph steamer *Faraday*. It is expected that the main portion will be completed during October next.

THE UNITED TELEPHONE COMPANY *v.* MOSELEY AND SONS.—This was a motion, in the High Court of Justice, on July 21st, before Mr. Justice Fry, to restrain Messrs. Moseley and Sons, of Manchester, until the trial of the action or further order, from manufacturing and selling carbon transmitters which were alleged to be infringements of a patent granted to Mr. Edison, on the 30th July, 1877. The Edison Telephone Company was formed in August, 1879, for the purpose of bringing into practical use in this country the instrument known as the Edison Loud-Speaking Telephone, and that company afterwards became amalgamated with the Bell Telephone Company, under the name of the United Telephone Company. The plaintiffs alleged that Mr. Edison was the original inventor of the method of producing undulatory electric currents in wire by the human voice so as to reproduce the sound, and that, prior to his patent, no person had ever employed carbon for that purpose. It appeared, however, that Mr. Edison had himself supplied certain publications in the United States with a description of a part of his invention, and that description having been copied into scientific journals here some weeks before Mr. Edison took out his patent, the Attorney-General's fiat was obtained enabling the inventor to disclaim so much of his specification as had been invalidated by the premature publication, but a condition was imposed that proceedings should not be taken in respect of transmitters actually made and completed before the date of the fiat. The defendants alleged that the carbon transmitters of which the company complained were made before the date of the fiat, but there were no numbers or identifying marks to distinguish them from instruments made since. Mr. Aston, Q.C., and Mr. Cozens Hardy appeared for the plaintiffs; and Mr. Ford North, Q.C., and Mr. Macrory for the defendants. It appeared in the course of the argument that the evidence in support of the plaintiff's case was incomplete, and application was accordingly made for the motion to be postponed for a week, but at the suggestion of his lordship, it was arranged that it should stand till the trial of the action.

IMPORTANT TELEPHONE DECISION.—Judge Lowell, of the United States Circuit Court, Boston, Mass., rendered an important decision on the 27th June, in

which he virtually confirms to the American Bell Telephone Company *the exclusive right of talking over a wire by electricity*. The suit in question was brought by the American Bell Telephone Company against Albert Spencer and others, and the decision, as we understand, is based on the fifth clause of Bell's claim, patent of February 14th, 1876, as follows:—"5. The method of, and apparatus for, transmitting vocal and other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air, accompanying the said vocal or other sounds, substantially as set forth." The court decides that the specific method of producing the electrical undulations employed by the defendants is different from the Bell plan. The defendant's device is made on the principle of the microphone, which has been very much improved since the date of the first Bell patent. The judge says:—"If the Bell patents were for a mere arrangement or combination of old devices to produce a somewhat better result in a known art, then, no doubt, a person who substituted a new element not known at the date of the patent might escape the charge of infringement. But Bell discovered a new art—that of transmitting speech by electricity, and has a right to hold the broadest claim for it which can be permitted in any case—not to abstract the right of sending sounds by telegraph without any regard to means, but to all means and processes which he has both invented and claimed." Judge Lowell pays a just tribute to the learning and ingenuity of Professor Reiss, but holds that his telephone of 1860 was an imperfect instrument, which, although some sounds of the voice could be sent, was still incapable of completely transmitting articulate speech. This differs from accounts we have had of the Reiss telephone, and perhaps the entire evidence in respect thereto was not brought out before the court. It may equally be said of Bell's telephone, that while it is a good receiver it is a poor transmitter—so poor that its use has been almost abandoned in favour of superior instruments such as the Blake or the Edison. If we had to rely only on the Bell instruments the telephone would be a nuisance, and the widespread use of speaking telegraphy now enjoyed could never have been realised.—*Scientific American*.

ELECTRIC LIGHT IN THE CITY.—The district allotted to the Electric Light and Power Generator Company has, we believe, not yet received its proper installation. What is the matter? The chairman of the company, at the meeting on the 20th ult., spoke of the care which had been bestowed to make the experiment *that evening* a success. The lamps put up for use are, we understand, of three kinds—the Weston, the Lontin, and the Harding lamps being each represented.

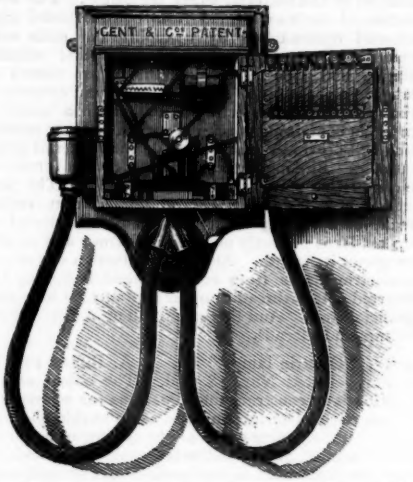
THE New York *World* says that it believes that Mr. Gould and the American Cable Company working together will establish on a sound basis an economical and efficient system of American ocean cables. It is stated that this company has ordered a third cable to supplement the one just finished and the second, which the contractors will complete in the autumn. There is, we have reason to believe, no truth in the statement.

INTERNATIONAL ELECTRIC EXHIBITION.—A memorial, signed by the Archbishop of Canterbury, Lord Shaftesbury, the Bishop of London, the Lord Mayor, the Rev. C. H. Spurgeon, Mr. Samuel Morley, M.P., and 22 other members of Parliament, and 7,296 members and friends of the Working Men's Lord's Day Rest Association, has been presented to the Prime Minister, expressing regret that it is proposed to open the English exhibits, including those of the Government, on Sunday at the International Electric Exhibition to be opened in Paris the first week in August. The memorialists submit that the public opinion of Great Britain has always been emphatically opposed to the opening of Exhibitions on Sunday; that all our own great Exhibitions have been entirely closed on the Sundays; that at previous Exhibitions in Paris and Vienna the English and American exhibits have been closed almost without exception; and that the Philadelphia Exhibition in 1876 was entirely closed on Sunday. The memoralists express a hope that Her Majesty's Government will order that no one shall be employed on Sunday in connection with the exhibits of the British Government at the forthcoming Electric Exhibition. Mr. Gladstone has sent the following reply to Lord Shaftesbury:—"10, Downing Street, Whitehall, July 20th, 1881. My Lord,—I am directed by Mr. Gladstone to assure you that the memorial which you have done him the honour to forward to him on the subject of the International Electric Exhibition shall have careful consideration.—I am, my Lord, your Lordship's obedient servant, J. A. GODLEY."

IT is announced that the next annual general meeting of the British Association for the Advancement of Science will be held at York, commencing August 31st. The president elect is Sir John Lubbock, Bart., M.P., F.R.S. The following notice to contributors of memoirs has been issued:—"Authors are reminded that, under an arrangement dating from 1871, the acceptance of memoirs, and the days on which they are to be read, are now, as far as possible, determined by organising committees for the several sections *before the beginning of the meeting*. It has therefore become necessary, in order to give an opportunity to the committees of doing justice to the several communications, that each author should prepare beforehand an abstract of his memoir, of a length suitable for insertion in the published Transactions of the Association, and the Council request that he will send it, together with the original memoir, by book-post, on or before August 1, addressed thus:—'General Secretaries, British Association, 22, Albemarle Street, London, W. For Section.....' Authors who comply with this request, and whose papers are accepted, will be furnished *before* the meeting with printed copies of their reports or abstracts. If it should be inconvenient to the author that his paper should be read on any particular days, he is requested to send information thereof to the secretaries in a separate note. G. GRIFFITH, Acting Secretary, Harrow, Middlesex."

MESSRS. J. T. GENT & Co., of Leicester, have recently brought out the form of telephone shown by the figure. The instrument is contained in a neat walnut case, to the cover of which, leaving a small space between, is attached a diaphragm of wood; the cover has the usual aperture for receiving the sound waves. Across the diaphragm, in proximity, but not in contact, are fixed thin plates of a specially prepared material To the cover brackets are attached, which carry a spindle, on which are loosely hung (vertically or horizontally) adjustable arms, each arm carrying a plug or pencil of the aforesaid material; these latter rest on the plates fixed to the diaphragm. 12 to 16 of the suspended arms and plugs are used, and these are arranged in series of three or four, so that a current of electricity to traverse the whole must pass over successive sets. The object of using a row of plates and arms is that the whole of the vibrations of the diaphragm may be utilised, resulting, it is stated, in proportionately powerful undulatory currents. One end of the row of plates is connected to a battery, the other end to an induction coil. Any form of telephone receiver may be used with the transmitter.

A flexible tube is used to contain the wires and protect them from injury, thus obviating one of the objections




to wire connections between receiver and transmitter. Automatic switches and bell form part of the apparatus. The arrangement of the transmitter and the employment of a flexible tube to protect the wires from injury form the chief peculiarities and points of novelty in the new instrument.

WE have received a prospectus of the "Telephone Training School," Upper Norwood, of which Mr. C. E. Winter is the electrician and principal. Practical instruction will be the object in view, and to this end every description of telephone as well as all apparatus appertaining thereto, for both exchange systems and private communication, will be provided, and so far as possible in duplicate, so that pupils will have the opportunity of dissecting and reconstructing the same. Tools and materials for making those parts of the various apparatus that can be made by hand will be furnished, and every facility given for conducting experiments by those pupils whose tastes incline them in that direction. Complete working telephone exchanges upon all the various systems in use in different countries will be in practical working order, and pupils will be trained to every department of their manipulation. Tools, poles, wire, insulators, brackets, &c., will be supplied for outdoor construction, concerning which practical instruction will be given. Pupils will then be enabled to avail themselves of testing their own abilities under personal supervision. Testing apparatus will also be provided, with which pupils will be taught to measure the electrical resistances of the various instruments, batteries and wires, and the more important matter of localising faults, both in the apparatus and on the line wires. Pupils desirous of extending their studies and practice to telegraphy will be afforded every facility for doing so. While the course of instruction will be essentially practical the theoretical will not be neglected. All the leading scientific journals will be provided. It will thus be seen that the course of instruction will be very complete. The school, it may be stated, is under influential patronage, the leading men in the telephone world, including the chairmen of the various telephone companies, being amongst the patrons.

BY a contract concluded between the German Telegraph Company in Berlin and the German Union Telegraph Company, a submarine cable is to be laid between Emden, on the Hanoverian coast, and Valentia, in Ireland, for the purpose of connecting Germany directly with the United States. At Valentia the new cable will be attached to and continued by the Anglo-American one, which will thus form a second wholly submarine electric tie between America and the Continent of Europe. The cost of the new Emden-Valentia cable, which, it is hoped, may still be laid in the course of this year, is calculated at about £165,000, and will be covered by the issue of 5½ per cent. preference shares.

THE BROOKS UNDERGROUND SYSTEM.—The laying of the second portion of the telegraph line (insulated by the above system) between Waterloo and Nine Elms is now accomplished, and the Post-office authorities are having their wires placed in connection therewith. We hope to publish the tests taken in our next issue.

A VOLTAMETER for measuring strong currents, and devised by Mr. G. M. Hopkins, has recently been described in the *Scientific American*. The action of this instrument depends on the heating effect of the current on a thin platinum or copper wire, the linear expansion of the wire giving the index more or less motion according to the strength of the current. The general construction of the apparatus is as follows:—A vertical plate of vulcanite supports a horizontal stud, upon which are placed two metal sleeves having a glass lining. To one of these sleeves is attached a counter-balanced arm, carrying at its upper end a curved scale, having arbitrary graduations determined upon by actual trial under approximately the same conditions as the instrument will be afterward subjected to in actual use. The other sleeve carries a light counter-balanced metal index, which moves in front of the curved scale. Each sleeve is provided with a curved platinum wire arm, dipping in mercury contained in an iron cup secured to the base. Two platinum or copper wires are stretched along the face of the instrument, and attached at one end to hooks passing through an insulating post, and after passing once around their respective sleeves on the index and scale, are attached to spiral springs, which in turn are connected with wire hooks extending through an insulating post projecting horizontally from the vulcanite plate. Under each wire there is a horizontal metal bar communicating under the base with one of the binding posts. The two other binding posts are connected separately with the two mercury cups. It will be seen that with this construction the expansion of the rear wire will move the scale, while the expansion of the front wire will move the index. In order to apply the current to any required length of wire, there is upon each of the horizontal bars a clamp, which may be placed anywhere along the bar and screwed up so as to clamp both wire and bar. Usually the current to be measured will pass from the battery or machine to one of the binding posts, thence to the forward horizontal bar, thence through the expansion wire connected with the index, through the sleeve of the index, and finally through the mercury cup to the other binding post. It will be observed that both scale and index will be moved in the same direction by the expansion of their respective wires, and that the atmospheric temperature affects both alike. This being true, it is unnecessary to take any account whatever of external temperature. The apparatus is inclosed in a glass case to prevent the cooling action of the draughts of air. By connecting the index expansion wire with a battery having an electro-motive force of one volt, the deflection is very slight, even with a very fine wire, but in a stronger current from a battery having an electro-motive force of five volts and upward, slight variations will be readily indicated.

## New Patents—1881.

3049. "Electric lamps." F. W. HADDAN. (Communicated by L. G. Woolley.) Dated July 12.

3053. "Battery telephones, resp transmitters, resp microphones." L. JACOBSON. Dated July 12.

3073. "Improvements in lamp casings or holders for containing and protecting electric light, and in apparatus to be used in connection therewith, the said apparatus being in part applicable for other purposes." D. GRAHAM. Dated July 14.

3122. "Manufacture of electric bridges for lamps." ST. G. L. FOX. Dated July 18.

3129. "Apparatus for the mechanical reproduction of sound." J. J. WALKER. Dated July 18.

3140. "Fac-simile telegraphs." E. G. BREWER. (Communicated by T. A. Edison and P. Kenney.) Dated July 19.

3166. "Electric lamps." W. MORGAN BROWN. (Communicated by G. P. Harding.) Dated July 20.

3177. "Improvements in the insulated coatings and covers or cases for wires and cables for the telegraphic and other analogous purposes, and in the machinery or apparatus employed in applying the coatings to the said wires or cables." T. J. MAYALL. Dated July 21.

3187. "Electric lamps or lighting apparatus." W. R. LAKE. (Communicated by J. V. Nichols.) Dated July 21.

3189. "Improvements in and relating to electric lamp or lighting apparatus, and in the manufacture of portions of the same." W. R. LAKE. (Communicated by H. S. Maxim.) Dated July 21.

3190. "Improvements in fittings for electric lighting apparatus and in the method of converting gas-fittings to such purposes." R. H. HUGHES. Dated July 21.

3214. "Electric lamps." A. M. CLARK. (Communicated by L. J. Bouteilloux and W. Laing.) Dated July 22.

3224. "Improvements in galvanic batteries and in the treatment of solutions therefrom for the recovery of useful products." J. and A. J. HIGGINS. Dated July 23.

3228. "Apparatus for controlling telephonic communications." J. IMRAY. (Communicated by L. A. Brasseur and O. Dejaer.) Dated July 23.

3231. "Commutators for dynamo or magneto-electric machines, or electro-motors." E. G. BREWER. (Communicated by T. A. Edison.) Dated July 23.

3238. "A system of electric contact for electric clocks and for other purposes, and process of purifying mercury employed therein." B. J. B. MILLS. (Communicated by G. Leclanché.) Dated July 25.

3240. "Improvements in obtaining electric light and in the apparatus to be employed therefor." T. E. GATEHOUSE. Dated July 25.

3247. "Self-acting electric clocks." F. F. REID and J. M. VALENTINE. Dated July 25.

## ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1880.

5014. "Electric lamps." J. W. SWAN. Dated Dec. 2. 6d. Relates to incandescent lamps, and consists chiefly of improvements in the carbon conductor itself and in the mode of attaching it to its connections. The inventor claims the formation of the carbon or carbons of an electric lamp from cotton thread converted by the action of sulphuric acid and carbonised by subjecting it to heat in a vessel or receptacle containing powdered carbon or other powder which will prevent the oxidation of the material under treatment. The construction of carbons formed from cotton thread with thickened terminations by wrapping the ends with strips of bibulous paper, muslin, or other suitable material, and then submitting the cotton thread so treated to the action of sulphuric acid, and afterwards carbonising it by subjecting it to heat in a vessel or receptacle containing powdered carbon or other powder which will prevent the oxidation of the material under treatment. Binding the ends of the cotton thread to the conducting wires in a peculiar manner. The production of carbons for electric lamps from cotton thread, compressing the converted cotton thread so as to render it perfectly uniform in texture and section throughout its length. Also the production of carbons for electric lamps from cotton thread flattening the converted cotton thread in order to obtain an increased superficial area. And the construction of the carbons of compound threads.

4755. "Electric lamps," &c. J. A. BERLY and D. HULETT. Dated Nov. 18. 6d. The object of the invention is to construct the apparatus for suspending or supporting electric lamps, so as to enable the said electric lamps (either when alight or not) to be pulled down, detached, or dropped to be regulated, replenished or otherwise attended to, and pushed back or readjusted to their former or any required position, the said lamps being either alight or ready for lighting or otherwise. Fig. 1 is an elevation or general view of one arrangement of the apparatus. Fig. 2 is a longitudinal section of the said apparatus. *a* is a flat bar of metal or other substance, and to which the electric lamps as well as the sliding and movable parts are attached. *b* shows the attachment of the lamp by its coronet, pendants, or other suspending or supporting arrangement to the piece, *a*. *c* is a piece of ebonite or other insulating material attached to the top of central rod, *a*, by means of the key, *d*, the piece, *c*, might be screwed on *a* or fixed to it in any other manner. *d*, key attaching the piece, *c*, to the rod, *a*. *e*, cover, in ebonite or other insulating material, pressing on the two conductor springs, *g*, which they maintain in position by means of the bolts and nuts, *f*. *f*, bolts and nuts securing the conductor springs, *g*, in position. *g*, conductors connecting the circuit wires attached to terminals, *n*, to the electric lamps by means of the strips of metal, *j*, against which they are made to press, and sliding up and down are always in electric communication with the said strips, conveying therefore the currents from terminals, *n*, to the electric lamps by means of the intermediate strips of metal, *j*, and the conducting wires, *h*, and this in whatever position of the movable or sliding portion of the apparatus. *k*, conducting wires attached to the bolts, *f*, and conveying the currents from contact pieces, *g*, to the lamps. *j*, strips of metal electrically connected with terminals, *n*, and against which the friction pieces, or springs, or electric collectors, *g*, always press in the upwards or downwards motion of the sliding or movable part. *k*, slips of wood or other non-conducting material attached to outside tube, *m*, which latter tube incases the whole arrangement and is attached to the ceiling plate. *n*, terminals fixed on ceiling plate, from which they are insulated and receiving the circuit wires. *p*, cover at end of tube, and in which a slot is managed to allow of the passing of the rod, *a*, and conducting wires, *h*, and at the same time acting as a guide to the sliding portion of the apparatus. *q*, india-rubber buffer to prevent the lamp knocking against bottom, *p*, of suspension arrangement in the upwards motion. *r*, india-rubber buffer to prevent knocking of the lamp against cover,

*p*, in the downwards motion. *t*, iron washer, against which the key, *u*, knocks in the sliding portion's downwards motion. *u*, key across rod, *a*, and extending to the outer tube and acting as a guide to the top of sliding or movable portion of the apparatus. *v*, bottom of rod, *a*, and to which the chains, *x*, are attached. *x*, chains attached to bottom piece, *v*, and receiving at their other ends the counterbalancing weights, keeping the whole of the sliding portion with its attached electric apparatus in constant equilibrium. *y*, pulleys over which the chains, *x*, are running. It will be seen from the foregoing description that in any position of the sliding portion of the apparatus the currents from the circuit wires attached to the terminals, *n*, fig. 2, will be conveyed to the strips of metal, *j*, and collected by the friction pieces, *g*, from which through bolts, *f*, to which they are electrically connected, the said currents will be conveyed to the lamps by means of the conducting wires which are attached to the heads of bolts, *f*.

FIG.2

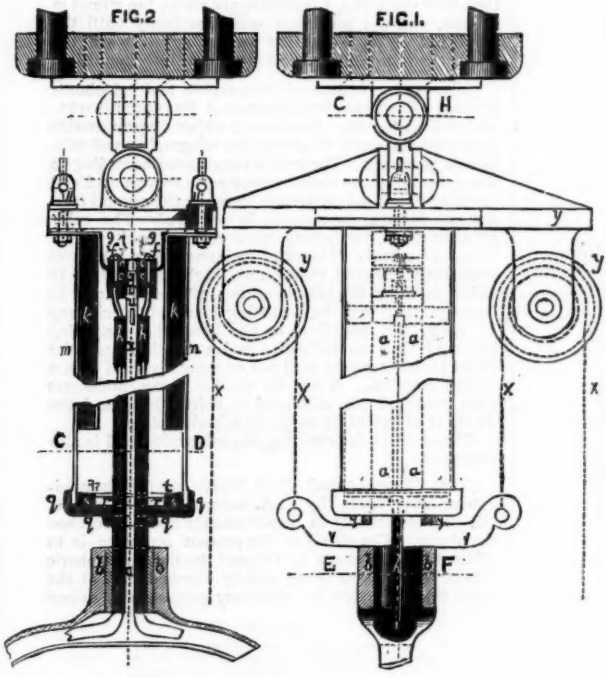



FIG.1.

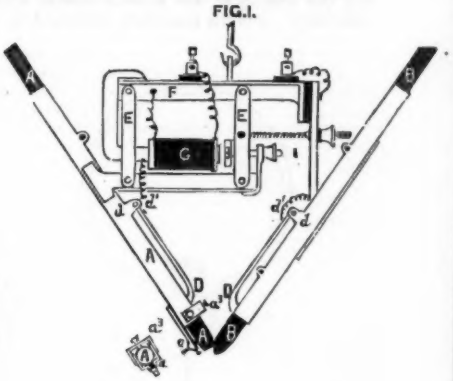
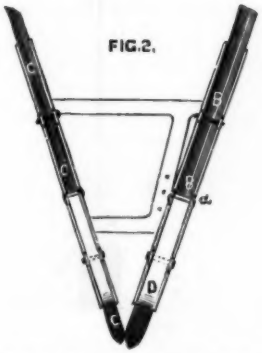


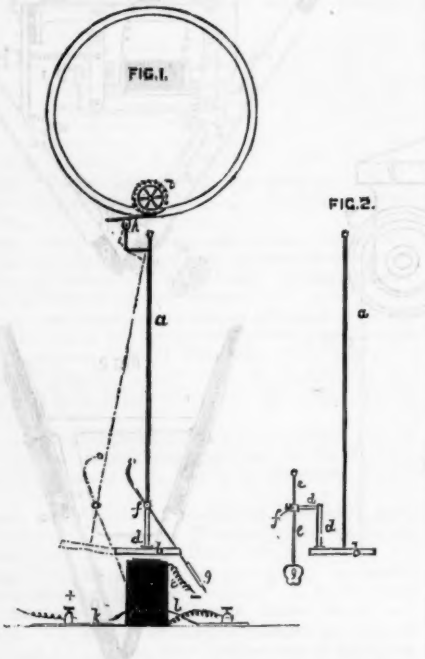

FIG.2.




4988. "Electric lamps." KILLINGWORTH WILLIAM HEDGES. Dated Nov. 30. 6d. Relates chiefly to the construction of electric lamps with inclined carbons. Fig. 1 is a front view of an electric lamp according to the invention, and fig. 2 is a side view of the pair of positive carbons. A is the negative carbon lying in an inclined trough or open tube, and butting near its end against an adjustable stop, *a*, so that the carbon descends as that portion of it against which *a* bears becomes consumed. The positive carbons, B and C, meet together at their ends, as shown in fig. 2, and one of these may be smaller than the other, so that the whole of the electrical current may pass through the larger, the smaller carbon becoming gradually consumed with it. The contacts for both the negative carbon, A, and the larger, B, of the positive carbons are made of pieces of metal, D, slightly hollowed to fit over the carbons, and hinged at higher points, *d*, to the troughs in which the carbons lie, the current being led to and from the contact pieces, D, by wires, $d^1$, escaping the joints of their hinges. The trough in which the carbon, A, lies is suspended by radius rods, E, E, from the upper framing, F, of the lamp to which the troughs for the carbons, B, C, are fixed. In the framing, F, is arranged an electro-magnet, G, having its coil in the lamp circuit, its armature, *g*, is attached to one of the radius rods, E, with a screw adjustment. When the lamp is out of circuit the end of the carbon, A, butts against the meeting of the carbons, B and C, but when an electric current is passed through the lamp, kindling the carbons where they butt, the electro-magnet, G, becomes excited and attracts its armature, *g*, whereby the end of the carbon, A, becomes separated from B and C, and the arc is established between them. As the carbons become consumed the two, B and C, continue to descend their respective troughs, the end of each supporting the other, and the carbon, A, advances, as permitted by the stop, *a*, so as to present its end at nearly the same distance from the ends of B and C. In order to render the stop, *a*, effective, an abutment screw, $a^3$, is provided at the upper side of the carbon, A.

The patent also relates to an incandescent lamp in which a carbon has its end resting on a periphery of a chisel-edged metal disc.

5051. "Time-pieces worked by electricity." W. P. THOMPSON. (A communication from abroad by Monsieur Alphonse Lemoine, of Paris.) Dated Dec. 4. 6d. Has for its object an improved system of electric time keeping, by the aid of an electro-magnet, which gives automatically to the pendulum of the clock a fresh impulse each time that its oscillation fails to attain to a certain amplitude of course. To arrive at this result the current is passed round the electro-magnet, each time that it is necessary, by a piece mounted upon the pendulum and manœuvred by the resistance that the air opposes to it during its oscillation. Fig. 1 shows the front view of the pendulum of a clock disposed according to the invention; fig. 2 represents the side view of the mechanism working the closing of the electric current when that is necessary. *a* is the pendulum furnished at its lowest




part with a piece, *b*, of soft iron forming the bob or weight; this bob is of soft iron in order to be at any desired moment drawn by the electro-magnet, *c*. Upon the bob, *b*, is a standard, *d*, upon the horizontal arm of which turns a light spindle, *e*, mounted upon a socket, *f*, and furnished at its lower part with a vane or other equivalent piece, *g*, in paper, mica, or other like material. Upon its upper part the pendulum of the clock carries a catch, *h*, which at each double oscillation advances one tooth of the wheel, *i*, which commands the minute hand, and which can be arranged in any convenient manner. Upon the stand of the clock is placed a fixed blade, *k*, communicating with one of the poles of a battery, the positive (+) pole, for example; another blade, *l*, forming a spring, communicates with the electro-magnet, binding it to the negative (—) pole of the battery. As long as the range of oscillation of the pendulum does not descend below the normal limit, the spindle, *e*, passes over the contact spring, *l*, without lowering it, by following the inclined path that the resistance of the air gives it (acting upon its vane). If, on the contrary, the range of oscillation diminishes, the speed of the pendulum diminishes in like proportion, and the resistance opposed by the air to the movement of the vane, *g*, must equally lessen in such manner that the spindle, *e*, approaches the vertical. It then presses upon the contact, *l*, which bends upon the blade, *k*, in such manner that, the circuit being closed, the current traverses the electro-magnet, which becomes active. As this effect is produced before the pendulum becomes vertical, as indicated by the dotted lines in the drawing, the armature or bob, *b*, of the pendulum is attracted, and regains its full range of oscillation under the influence of this impulse; the spindle, *e*, gliding then over the blade, *l* (which again rises), the circuit is broken, and the pendulum oscillates freely until the amplitude of its oscillation lessens again, when the contact is re-established and gives it a fresh impulsion.

5083. "Manufacture of telegraphic and telephonic cables." EDOUARD BERTHOUD and FRANCOIS BOREL. Dated Dec. 6. 6d. Has for its object improvements in the manufacture of cables for telegraphic and telephonic purposes. The cables constructed according to this invention have their various parts so arranged and combined that all induction between the several conductors forming one cable is obviated. The cable consists of a conducting wire covered with several layers of cotton. This wire is immersed in a bath of insulating material raised to a high temperature in order to carry off the dampness of the wire, and to impregnate it with the insulating material, which may be resin, tar, paraffine, or the like; the insulating coating is then covered with a leaden sheathing, and the latter is then covered with one or more layers of cotton or like material. A suitable number of the conductors thus prepared are submitted to a fresh bath, and the whole is protected by means of a leaden pipe.

The machine for covering the cable with lead is also described.

5113. "Telephones." J. B. MORGAN. (A communication from abroad by T. A. Edison.) Dated Dec. 8. 6d. Relates chiefly to improvements upon the carbon telephone. The object of the present invention is to allow the diaphragm to respond to the atmospheric vibrations without being unduly checked, and at the same time to insure the necessary pressure and extent

FIG 1.

of surface contact between the carbon, or similar material, and the electrodes to produce the corresponding electric changes or undulations in the line. In the figure the diaphragm is represented at *a*, with a suitable case, *b*, and mouth piece, *c*, the diaphragm, *a*, resting upon or being secured at its edges to the said case, *b*. The carbon or similar material for regulating the electric condition of the line is shown at *i*. The carbon,

*i*, is in a cup, *d*, of insulating material, such as hard rubber. One metallic electrode, *e*, is in the form of a metal rivet that holds the cup, *d*, to the diaphragm; the carbon rests against this. The other electrode is in the form of a platina disc at the end of the screw, *f*, that passes through the spring, *g*, that is connected at its ends to the cup, *d*, so that the proper initial pressure is applied to the carbon by the screw. There is a weight, *h*, carried by the spring, and one wire, *k*, is connected to the diaphragm, and the other wire, *l*, to the spring, *g*.

5137. "Electric machinery and apparatus for the production of light and heat," &c. W. T. HENLEY. Dated Dec. 9. 2s. 8d. Relates chiefly to the dynamo machine described on page 288 of this JOURNAL. It also relates to new electric lamps.

5141. "Magnetic apparatus for separating iron particles from wheat, flour," &c. T. M. CLARKE. Dated Dec. 9. 2d. Has for its object a magnetic apparatus to separate iron particles, such as are very apt to be found in grain, or to fall or break off from machines into the material passing through the mill. In this invention the magnets are made to rotate, forming parts of a roller or cylinder, or series of wheels or cylinders, provided with a stationary or movable scraper or scrapers, brush or brushes, or their mechanical equivalent on the opposite side to that over which the wheat passes, or fixed in such a manner as to remove the iron particles from the magnets as they revolve and prevent said particles from being brought back into the material to be purified. (*Provisional only.*)

5162. "Transmitting and receiving apparatus of printing telegraphs." H. VAN HOEVENBERGH. Dated Dec. 10. The general object of the invention is to increase the rapidity and certainty of operation of type-printing telegraphic apparatus, and to provide improved means of maintaining the synchronism between the transmitting cylinder at the sending station and the type wheel at the receiving station or stations, by causing the same to be regulated or adjusted automatically once during each revolution, instead of at irregular intervals, and at the will of the transmitting operator, as in the apparatus heretofore in general use.

5275. "Electric lighting," &c. DESMOND GERALD FITZ-GERALD. Dated Dec. 16. 2d. Relates to improvements in incandescence electric lamps. When a carbonaceous conductor is employed, and more particularly when this is obtained by the carbonisation of vegetable substance, any required degree of hardness or solidity and of electrical conductivity or resistance, is given to the conductor by treating the vegetable substance or the carbon obtained therefrom with solutions rich in carbon (this element being liberated by subsequent ignition), also with salts of the refractory metals, such as platinum or irridium, and with salts, such as those of magnesium and cadmium, which when decomposed furnish an infusible earth or oxide, the metal, earth, or oxide being obtained in admixture with the carbon. (*Provisional only.*)

5340. "Telephone signal apparatus." WILLIAM MORGAN-BROWN. (A communication from abroad by George Henry Bliss, of America.) Dated Dec. 20. 8d. Relates to telephone signal apparatus, and contains a series of clockworks arranged to run synchronously, and each controlling a signal bell in the circuit so as to allow it to sound only at certain predetermined periods of time, the said periods being different at each instrument, so that only one signal can be operated at any one time, the others then being kept silent by the said controlling clockwork. The clocks are all automatically stopped at the end of an interval of operation, in which each has had its individual period in which the signal could be sounded, and they remain so stopped until it is desired to give a signal at any of the stations, when the instruments are all started simultaneously by electro-magnets acting on the stop mechanism.

## City Notes.

Old Broad Street, July 27th, 1881.

THE DIRECT UNITED STATES CABLE COMPANY, LIMITED.—The report of the directors for the six months ending June 30th, 1881, states that the revenue for the half-year, after deducting out-payments, amounted to £93,581 14s. 8d. The working and other expenses for the same period, including interest on debentures, and income tax, &c., amounted to £26,871 12s. 7d., leaving a balance of £66,710 2s. 1d. as the net profit for the half-year, making, with £3,116 17s. 7d. brought forward from the previous half-year, a total of £69,826 19s. 8d. Three quarterly interim dividends of 1¼ per cent. each, amounting to £45,532 10s., have been declared and paid at the usual times during the financial year, and a final dividend of 5s. per share is now proposed, making, with the three interim dividends, 5 per cent. for the year, being a total distribution of £60,710. The appropriation of the above balance of £69,826 19s. 8d. on the revenue account is thus shown:—Interim dividend for quarter ending 31st March last, £15,177 10s.; final dividend now proposed, £15,177 10s.; carried to reserve fund, thereby increasing it to £235,000, £32,292 9s.; carried forward to next account, £7,179 10s. 8d. The cables are now, and have been since the last report, in good working order.

EASTERN TELEGRAPH COMPANY, LIMITED.—The eighteenth half-yearly ordinary meeting of the shareholders of this Company was held, on July 14th, at the City Terminus Hotel, Mr. J. Pender, M.P., in the chair. The chairman, in moving the adoption of the report (*see* TELEGRAPHIC JOURNAL, July 15th), said that the revenue showed an increase of £10,964. This increase was to some extent accounted for by the improved return upon their investment in the South African Company. The ordinary expenses of the Company showed a decrease of £883 over those of the last half-year, but the expenses of the former period included charges which did not come into the figures of 1880. The accounts were very fully set out, every item of importance being stated in them. Generally on these occasions he had been able to congratulate the proprietors upon the fact that their cables were in perfect working order, but he was sorry to say that the two Bombay cables were not now in working order. It was believed, however, that the damage was but a short distance from the shore, and might easily be repaired. Beyond delay in the traffic, he did not see in the stoppage any cause for uneasiness. Submarine telegraphy was always more or less a speculative investment. They knew that their cables were at the bottom of the sea, but they were uncertain as to what the bottom of the sea was. Within the last ten days the French cable was repaired, and it was now in good working order. They had also within the last month repaired a cable from 2,000 fathoms of water, so that whilst their property was speculative, their experience was leading them to the knowledge of how to deal with it. Repairs was always a large item, but if they took them from the commencement, they would find that they had been something

under 10 per cent. on the capital. He had to congratulate the shareholders upon the fact that they were able to pay some slight addition to the dividend, and he hoped that it might be still further increased. To enable them to earn a steady dividend, and to give their property something like a good footing in the general market, it was most important that they should add to the reserve fund. In the early stages of the Company they were not in a position to add largely to the reserve fund; but the average additions since the commencement had been about £41,000. They felt that they were fairly represented in that respect, but they had not sufficient to enable them to say that they were independent. It was therefore desired that the policy of adding to the reserve fund should continue. The motion was seconded by the Marquess of Tweeddale. In the course of a brief congratulatory discussion which followed, it was mentioned by the chairman that the cost of repairing the Bombay cable might be about £5,000. Owing to combination with other companies, the break had not caused any stoppage of their business. The resolution was adopted unanimously, and a vote of thanks to the chairman closed the proceedings.

THE GERMAN UNION TELEGRAPH AND TRUST COMPANY.—An extraordinary general meeting of the members of the German Union Telegraph and Trust Company, Limited, was held on Monday, July 18th, at the offices of the company, Old Broad Street, "for the purpose of considering proposals of the German Union Telegraph Company of Berlin for establishing a new cable between Germany and Ireland, and raising capital for the purpose by the issue of preference shares, and passing such resolutions with respect thereto as the meeting may deem expedient." Sir James Anderson presided, and stated that the object of the proposed new cable was to give Germany direct communication with America, which the German Government and their telegraph administration particularly desired to have. The German Union Company of Berlin had undertaken to bring a cable connecting Germany with Valencia, and to have one of the Anglo-American Company's cables to go thence to America. In exchange the concessions offered to the German Union Company contained in it some clauses which gave them the preference of laying any further cable which might be required to meet the wants of Germany. It would also give the German Union Company a duplicate cable. The directors of this company concurred with the directors of the German Union Company in laying the cable and securing themselves from opposition. For all purposes Germany by the new cable would have as direct communication to America as had France and England. No doubt it would affect the ordinary shares of this company, but not so much as it would if it were a rival cable. The founders of the original company had the right to a full half of the new shares, and if they took them, as it was assured they would, then the shareholders of this company would be allowed to apply for the other half, *pro rata*. The directors of this company considered that the investment was a fair one. The proposed capital was £165,000, and powers would be taken to raise that amount in 5½ per cent. preference shares. He concluded by moving the following resolution:—"That this meeting having considered the proposals of the German Union Telegraph Company of Berlin with respect to the laying of a new cable between Germany and Valencia, and the chairman's explanation in regard thereto, it is hereby resolved that such proposals be generally approved, and that the directors of this company be authorised to communicate this resolution to the Berlin Company, and to make such arrangements with that company with respect to the issue of the new shares as they may think expedient, and to secure for the shareholders of this company the opportunity of subscribing for such of the new shares of the Berlin Company as they may be entitled to in respect of their holdings in this company." Count Oscar Reichenback (a director) seconded the motion. In reply to Mr. Dunphy, the chairman stated that the object of the new cable was to give Germany direct telegraphic communication to America, instead of the messages coming to London first. The new cable would have to be laid by the German Union Company, or by some one else. It would have one wire, and be used exclusively for American traffic. There were four wires in the present cable, which, of course, would be maintained. In answer to Mr. Pender, M.P., the chairman added that the new capital would be a first charge on the whole revenue of the company. The resolution was unanimously passed.

GLOBE TELEGRAPH AND TRUST.—The report for the year ending July 18th states that the net revenue, after deduction of expenses, amounts to £171,379, which, with the balance of £841 brought forward, makes a total of £172,221. From this amount there has been distributed in interim dividends the sum of £122,066, and the directors have written a further sum of £500 off the preliminary expenses account, leaving an available balance of £49,655. The directors now recommend payment of a final dividend for the year of 3s. per share on the preference shares, and of 3s. per share on the ordinary shares (making, with the former distributions, a total dividend for the year of 6 per cent. upon the preference and 4½ per cent. upon the ordinary shares), carrying forward a balance of £665. The directors have issued 527 preference shares and 525 ordinary shares in exchange for 1,000 Eastern Telegraph ordinary shares; and an exchange has been made of 1,000 Telegraph Construction and Maintenance shares for 3,000 Eastern Telegraph ordinary shares. Eleven shares of the German Norwegian Cable Company have been drawn and paid off at par. In conformity with the articles of association, Mr. William Ford and Sir Daniel Gooch, Bart., M.P., two of the directors, retire, but being eligible, they offer themselves for re-election. The auditors, William Newmarch, Esq., F.R.S., and John George Griffiths, Esq., F.C.A. (Messrs. Deloitte, Dever, Griffiths, and Co.), also retire at the meeting. Mr. Griffiths offers himself for re-election, but Mr. Newmarch, much to the regret of the board, does not. A statement appended to the report shows the stocks, shares, and debentures held by the company, and the income therefrom. The total nominal amount of these holdings is £3,367,738, the cost by exchange or sale and purchase £3,260,367, and the amount of dividend received during the year £174,766.

ELECTRIC LIGHT AND POWER GENERATOR COMPANY.—An extraordinary general meeting of the shareholders of this company was held at the company's offices and works, 29, Bankside, on Wednesday, July 20th, 1881, to confirm a special resolution, passed at a meeting of members on July 5th, for making certain alterations in the articles of association. Admiral Sir Edward Inglefield, C.B., occupied the chair. The secretary read the notice convening the meeting and setting out the proposed alterations in the articles. The chairman said: Gentlemen, I have to put this special resolution before you and to propose that you agree to it. The resolution was carried, and several questions having been addressed to the chairman, that gentleman said he would reply to them

categorically: First with regard to the district allotted to the company for lighting. It was called No. 2, and comprised Southwark Bridge, Queen Street Place, and Queen Victoria Street. They had the advantage of having several distinct cables, in case one portion should not be as successful as the other; in fact they had four distinct cables, so that, for instance, if they should find that evening that one portion did not work well they could still go on working with the other three without the fourth. Accidents might happen, a cab running against one of the lamp posts would break the contact for a time, but by having three other cables to work with there need be no apprehension on the part of either the shareholders, however anxious they might feel, or of the public, that there could be any serious breakdown even should any unforeseen accident occur. The shareholders probably knew the district quite well, and he need not, therefore, give particulars as to the length of cable and so on required, but he believed it was about four miles. He would, however, like to explain the precautions which had been taken to insure the success of their experiment that evening. In the first place the cable was of course laid and was intact, and all the lamps were in order in the works ready to be hung, and he would be happy to exhibit them to the shareholders when the meeting was over. They had, in fact, had every one of the lamps hanging side by side in the works, so that the ability of each lamp to thoroughly do its work had been fully tested. In every respect they had taken every care to insure success as far as possible that evening, and there could be no doubt that their success was a certainty. In answer to a question by a shareholder, Mr. Crookes said that through a good cable 75 per cent. of the power could be carried to a very distant part. The meeting having terminated, the shareholders proceeded to inspect the preparations going on in the works.

WESTERN AND BRAZILIAN TELEGRAPH.—The eighth ordinary annual general meeting of this company was held at the Cannon Street Hotel on Wednesday, 20th inst., Sir Henry Drummond Wolff in the chair. The secretary read the notice convening the meeting, as also the minutes of the last annual meeting, which were confirmed, and the report and accounts were taken as read. The chairman: It now becomes my duty, gentlemen, which I rise to fulfil with some diffidence owing to my recent connection with this company, to make a few remarks upon the report which was issued and circulated among you some time ago, and to give the reasons why the directors postponed the ordinary annual general meeting until this time. You will, no doubt, be gratified to know that the traffic of the company has been increasing, slowly it is true, but with a regular progression. At the present moment, by the most recent traffic returns for a period of forty-one weeks, we can show a balance of receipts over expenses as compared with the same period in last year of £4,854. (Hear, hear.) In fact, the receipts are gradually mounting up, and, unless an accident of a serious nature occurs between now and next October, would warrant the directors in declaring some dividend, provided we had a substantial reserve fund to justify us in dividing amongst the shareholders the profits made. (Hear, hear.) I will not dwell very much upon the general features of the report itself, inasmuch as when the report was issued you were informed that any additional information which was desired could be obtained at the offices of the company. Up to this time, however, there have been but very few applications for information or explanation at the office; therefore, if there were any questions that the shareholders wished to have answered we may fairly conclude that they would have been asked. But I shall be happy now to give any information you wish for with regard to any of the details of the report. I am now coming to deal with that which I consider, and which you will no doubt also consider, the most important object of the meeting held this day, which is, that the meeting should either confirm or reject the offer of compromise which has been made to us with regard to a suit now pending in the Court of Chancery. The directors might rightly under their powers have accepted this compromise without reference to the shareholders. We consider, however, that, although the statute confers upon us the power, yet as the claims which are the subject of litigation in that suit rather concerned the inception of the company than its actual progress since it was formed, and as the subject was of such grave importance to the company, we deemed it our duty to submit the compromise to your judgment and approval. (Hear, hear.) I must say, however, that the directors, though not doubting in any way the strength of their case, have, under the advice of the same eminent counsel as have advised them all through the proceedings, determined to recommend the acceptance by the shareholders of the offers made to us. Our reason for that is simply this: we see and recognise the great necessity for establishing a good and substantial reserve fund, and we think that by accepting this proposal we shall be enabled at once to carry out that important object. (Hear, hear.) Therefore I beg to propose the adoption of the report, which will be seconded by one of my colleagues, and after that I shall be happy to answer any questions you may wish to put. Then, after that, we propose, with the consent of the meeting, to move a further resolution, which will embody the substance of the supplemental report which has also been issued, and accompanied the report itself. I beg to propose the adoption of the report. Mr. Andrews: I have great pleasure in seconding that resolution. The chairman: Is it your pleasure that the report, accounts, and balance-sheet up to September 30th, 1880, be approved and adopted? Carried unanimously. The chairman: I will now propose the next resolution—"That the company, in general meeting assembled, hereby approves of the directors compromising the actions referred to in the reports submitted to this meeting, on the basis stated in general terms in the supplemental report dated the 12th July, 1881, with such modifications or alterations and provisions not affecting the net results to the company as the directors may deem expedient and the nature of the arrangement may require." Mr. Goodsall: I beg to second it. The motion confirming the acceptance of a compromise was then put to the meeting and carried unanimously. Sir H. Drummond Wolff and Mr. D. H. Goodsall having been re-elected as directors, and Mr. Weise re-elected as auditor, the meeting closed after warm expressions of confidence in the chairman and his colleagues.

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS COMPANY, LIMITED.—At the half-yearly general meeting of this company held on the 21st July, Mr. George Henderson in the chair, the secretary (Mr. William J. Tyler) having read the notice convening the meeting, the chairman said: Gentlemen, this is merely a formal meeting to obtain your sanction to an interim dividend, and we are very pleased at having it in our power to pay this dividend from fairly earned money. The general business of the company is going on in a very satisfactory manner, but orders for cables have been slack during the half-year. I have really nothing more to say to-day, and therefore I will move the resolution that an interim dividend of 10s. per share, free of income-tax, being at the rate of 10 per cent. per

annum, payable on and after the 22nd inst., be now declared. Mr. S. W. Silver seconded the motion, which was carried unanimously. After a vote of thanks to the chairman the proceedings terminated.

CUBA SUBMARINE TELEGRAPH COMPANY.—At the meeting on July 20th, the report (*see* TELEGRAPHIC JOURNAL, July 15th) and accounts were adopted after a few remarks by the chairman, Mr. T. Hughes, Q.C., and some of the shareholders.

TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY, LIMITED.—A half-yearly general meeting of this company was held on July 19th at the offices, 38, Old Broad Street, under the presidency of Sir D. Gooch, Bart., M.P. The chairman (who had no resolution to propose) stated that during the past half-year they had not had very much in hand. They had made only 200 miles of cable, but they had chartered one of their ships to the Government for the conveyance of troops to the Cape, and another for some cable work. The *Scotia* had recently returned from repairing the Brest cable, which was now in efficient working order. Last year the enterprise failed on account of the extremely bad weather, and the vessel returned home, leaving the work uncompleted. This year, however, she had succeeded, having raised the cable from 1,700 fathoms of water, and a new piece of cable was put in. They were doing the best they could to obtain work, and they must hope that something would occur by which they would receive employment. Mr. W. Abbott asked, in view of the development of electricity, whether the company could not ally itself with some of the companies concerned in inventions arising out of the science of electricity, so as to fill up the void when cable work was slack? He thought that they should identify themselves with other work besides cable manufacturing. The chairman, in reply, said that they had not overlooked the matter, and that they were now making a large amount of covering wire required for the electric light, which, there could be no doubt, was only just beginning to be used. In answer to another question, the chairman said that the dividend would be the usual interim distribution of 12s. The meeting closed with the usual complimentary vote.

TELEGRAPHING TO INDIA, AUSTRALIA AND CHINA.—The following communication from the Indo-European Telegraph Company, Limited, has been addressed to the daily press:—"Both the cables of the Eastern Telegraph Company between Aden and Bombay are broken down on the Bombay coast, and cannot at present, in spite of every effort, be got at for repairs owing to the monsoon being in full activity. Of the cables belonging to the Indo-European Government Department in the Persian Gulf, and forming part of the Indo-European Telegraph *via* Teheran, one of the two cables between Bushire and Jask is interrupted, and the cable off the Beloochistan coast is also broken down. This reduces the communication between Bushire and Kurrachee, and consequently that between Europe and India, to only one wire, instead of the four wires and two duplicated routes which are usually at the disposal of the public. In reference to the notice from the Turkish Ambassador that messages may be transmitted by way of Bagdad and Bushire, such a course would be very inadvisable, because the present special direct wires of the Indo-European Telegraph Company to Teheran and thence to Bushire are working without any delay whatever, the delay lying between Bushire and Kurrachee. At the time of writing, however (noon of Monday), the delay from India has been reduced to two hours fourteen minutes, and telegrams from China and Australia are arriving in from four to five hours. The Indo-European Government Department have ordered their cable-repairing ship, *Patrick Stewart*, to proceed at once to Bushire to set right the Bushire-Jask section, and the repair of this section will greatly improve the working. As soon as this object is accomplished she will be ordered to repair the cable along the Beloochistan coast, thus restoring the duplicate wires of the Indo-European route *via* Teheran, when all delay will cease, as either of the duplicated lines of the Indo-European or of the Eastern route is easily capable of doing all the work when they are in their usual order."

AN Ottawa telegram states that the Canadian, European, American, and Asiatic Company, to which a charter was granted in the last Dominion Parliament, has completed its organisation. The Canadian end of this cable will land on Sable Island. Telegraphic communication will also be established with the West Indies.—*Liverpool Journal of Commerce.*

IN view of the competition expected from the American Cable Company, the Anglo-American, with the Direct U. S., and the Compagnie Francaise, advertise a reduction in tariff on and after August 1st to New York to 1s. per word, the name of the place from which the message originates being transmitted free of charge.

The following are the final quotations of stocks and shares for the 27th ult.:—Anglo-American, Limited, 51¾-52¼; Ditto, Preferred, 82½-83½; Ditto, Deferred, 25-25½; Brazilian Submarine, Limited, 10⅞-10½; Brush Light, ——; Electric Light, ⅜-⅝; Consolidated Telephone Construction, ⅛-¼ A; Cuba, Limited, 9¾-10¼; Cuba, Limited, 10 per cent. Preference, 16¾-17¼; Direct Spanish, Limited, 4¾-5¼; Direct Spanish, 10 per cent. Preference, 13½-14½; Direct United States Cable, Limited, 1877, 10⅛-10⅝; Debentures, 1884, 102-104; Eastern Limited, 10⅛-10⅝; Eastern 6 per cent. Preference, 12⅛-13⅛; Eastern, 6 per cent. Debentures, repayable October, 1883, 103-106; Eastern 5 per cent. Debentures, repayable August, 1887, 104-107; Eastern, 5 per cent., repayable Aug., 1899, 106-109; Eastern Extension, Australasian and China, Limited, 11-11¼; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 109-112; 5 per cent. Australian Gov. Subsidy Deb. Scrip, 1900, 103-106; Ditto, registered, repayable 1900, 103-106; Ditto, 5 per cent. Debenture, 1890, 103-105; Eastern and South African, Limited, 5 per cent. Mortgage Debentures, redeemable 1900, 104-107; Ditto, ditto, to bearer, 104-107; German Union Telegraph and Trust, 9½-10⅛; Globe Telegraph and Trust, Limited, 6⅛-6¼; Globe, 6 per cent. Preference, 12½-12¾; Great Northern, 12¾-13¼; 5 per cent. Debentures, 102-105; India Rubber Company, 20½-21½; Ditto, 6 per cent. Debenture, 104-108; Indo-European, Limited, 28-29; London Platino-Brazilian, Limited, 5¼-6¼; Mediterranean Extension, Limited, 2¾-3¼; Mediterranean Extension, 8 per cent. Preference, 9-9½; Oriental Telephone, ½ dis. par.; Reuter's Limited, 12-13; Submarine, 285-295; Submarine Scrip, 2¾-3; Submarine Cables Trust, 100-104; United Telephone, 9¼; West Coast of America, Limited, 4¼-5; West India and Panama, Limited, 1¾-2⅛; Ditto, 6 per cent. First Preference, 7-7½; Ditto, ditto, Second Preference, 6-6½; Western and Brazilian, Limited, 8¼-8½; Ditto, 6 per cent. Debentures "A," 110-115; Ditto, ditto, ditto, "B," 101-105; Western Union of U. S. 7 per cent., 1 Mortgage (Building) Bonds, 125-130; Ditto, 6 per cent. Sterling Bonds, 106-110; Telegraph Construction and Maintenance, Limited, 31¼-31¾; Ditto, 6 per cent. Bonds, 103-107; Ditto, Second Bonus Trust Certificates, 3⅞-4⅛.